CLAIMS

1. An emitter, comprising:

an electron supply;

a tunneling layer disposed on the electron supply;

a cathode layer disposed on the tunneling layer; and

a conductive electrode having multiple layers of conductive material including a protective layer disposed on the cathode layer and wherein the conductive electrode has been etched to define an opening thereby exposing a portion of the cathode layer.

2. The emitter of claim 1 wherein the protective layer is titanium or molybdenum.

3. The emitter of claim 1 wherein the protective layer has a thickness about 300 to about 1500 Angstroms.

4. The emitter of claim 1 wherein the cathode layer includes gold, tantalum, platinum, or combinations thereof.

5. The emitter of claim 1, further comprising;

an electron lens for focusing electrons emitted from the exposed portion of the cathode layer.

6. The emitter of claim 1, wherein the protective layer is a first protective layer and the conductive electrode is a first conductive electrode, the emitter further comprising:

a second protective layer disposed on the first conductive electrode and defining an opening in substantial alignment with the opening of the first conductive electrode;

a spacer layer disposed on the second protective layer and defining an opening in substantial alignment with the opening of the first conductive electrode; and

a second conductive electrode disposed on the spacer layer and defining an opening in substantial alignment with the opening of the conductive electrode.

7. An integrated circuit, comprising:

a substrate;

at least one emitter of claim 1 disposed on the substrate; and

circuitry formed on the substrate with the emitter for operating the at least one emitter.

8. An electronic device, comprising:

the emitter of claim 1 for emitting energy; and

an anode structure for receiving the emitted energy and generating at least a first effect in response to receiving the emitted energy and a second effect in response to not receiving the emitted energy.

9. The electronic device of claim 8 wherein the electronic device is a mass storage device and the anode structure is a storage medium, the electronic device further comprising a reading circuit for detecting the effect generated on the anode structure.

10. The electronic device of claim 8 wherein the electronic device is a display device and the anode structure is a display screen that creates a visible effect in response to receiving the emitted energy.

11. The electronic device of claim 10 wherein the display screen includes one or more phosphors operable for emitting photons in response to receiving the emitted energy.

12. An emitter, comprising:

a cathode layer having an emissive surface;

an electron lens disposed at a predetermined distance from the emissive surface; and

at least one sacrificial layer disposed between the cathode layer and the electron lens, the at least one sacrificial layer having an opening substantially aligned with said emissive surface.

13. The emitter of claim 12 wherein the at least one sacrificial layer is titanium or molybdenum.

14. The emitter of claim 12 further comprising a spacer layer of tetraethylorthosilicate, silicon oxides, silicon nitrides, or combinations thereof separating the electron lens and emissive surface.

15. A storage device, comprising:

at least one emitter to generate an electron beam from a cathode layer, the emitter having a conductive protective layer and defining an opening from which the electron beam is generated disposed on the cathode layer;

a lens for focusing the electron beam to create a focused beam; and

a storage medium in close proximity to the at least one emitter, the storage medium having a storage area being in one of a plurality of states to represent the information stored in that storage area;

such that:

an effect is generated when the focused beam strikes the storage area;

the magnitude of the effect depends on the state of the storage area; and

the information stored in the storage area is read by measuring the magnitude of the effect.

16. The storage device of claim 15 wherein the effect is a signal current.

17. An emitter, comprising:

an electron supply;

a tunneling layer formed on the electron supply;

a cathode layer formed on the tunneling layer; and

a conductive protective layer disposed on the cathode layer wherein the conductive protective layer has been etched to define an opening thereby exposing a portion of the cathode layer for electron emission.

18. The emitter of claim 17 capable of emitting photons in addition to the electron emission.

19. A display device using the emitter of claim 17 to form a portion of an image from the emitted photons.

20. The emitter of claim 17 wherein the conductive protective layer has been etched with sulfuric peroxide.

21. The emitter of claim 17 further comprising a lens structure formed on the conductive protective layer before the conductive protective layer is etched.

22. The emitter of claim 21 wherein the lens structure comprises a spacer layer formed of tetraethylorthosilicate, silicon oxides, silicon nitrides, or combinations thereof.

23. A display device, comprising:

an integrated circuit including the emitter of claim 17, wherein the emitter creates a visible light source; and

a lens for focusing the visible light source, wherein the lens is coated with a transparent conducting surface to capture electrons emitted from the emitter.

24. A storage device, comprising:

an integrated circuit including the emitter of claim 17 wherein the emitter creates a focused electron beam; and

a storage medium in close proximity to the emitter, the storage medium having a storage area being in one of a plurality of states to represent the information stored in that storage area;

such that:

an effect is generated when the focused electron beam strikes the storage area;

the magnitude of the effect depends on the state of the storage area; and

the information stored in the storage area is read by measuring the magnitude of the effect.

25. An electronic device, comprising:

an integrated circuit including the emitter of claim 17; and

a focusing device for converging the emissions from the emitter.

26. A computer system, comprising:

a microprocessor;

the electronic device of claim 25 coupled to the microprocessor; and

memory coupled to the microprocessor, the microprocessor operable of executing instructions from the memory to transfer data between the memory and the electronic device.

27. The computer system of claim 26 wherein the electronic device is a storage device.

28. The computer system of claim 26 wherein the electronic device is a display device.

29. An emitter, comprising:

a substrate;

an insulator layer formed on the substrate and having a first opening defined within;

an emission layer disposed over the insulator layer and first opening and contacting the substrate;

a tunneling layer formed on the emission layer;

a cathode layer disposed on the tunneling layer wherein a portion of the cathode layer on the tunneling layer is an electron-emitting surface; and

a conductive protective layer disposed on the cathode layer and defining a second opening substantially aligned with the first opening.

30. The emitter of claim 29 wherein the electron emitting surface has an emission rate of about 0.1 to about 8.0 Amps per square centimeter.

31. The emitter of claim 29 wherein the protective layer is formed of titanium or molybdenum.

32. The emitter of claim 29 wherein the emission layer is formed of polysilicon.

33. The emitter of claim 29 further comprising an electron lens disposed a first distance from the electron-emitting surface.

34. The emitter of claim 33 further comprising a spacer layer of tetraethylorthosilicate, silicon oxides, silicon nitrides, or combinations thereof disposed between the electron lens and the protective layer.

35. The emitter of claim 34 wherein the stress created between the spacer layer and the cathode layer is less than an absolute value of about 100 mPascals.

36. The emitter of claim 34 wherein the spacer layer etch rate and the protective layer etch rate have an etch selectivity at least about 10:1.

37. The emitter of claim 29 wherein the protective layer has been etched with sulfuric peroxide or ammonia and water to create the defined opening within the protective layer.

38. The emitter of claim 37 wherein the sulfuric peroxide etch is performed using about 1 part H_2O and about 2 parts H_2SO_4.

39. An integrated circuit comprising at least one emitter of claim 29.

40. A display device comprising at least one emitter of claim 29.

41. A storage device comprising at least one emitter of claim 29.

42. An electronic device comprising at least one emitter of claim 29.

43. An integrated circuit, comprising:

a substrate;

at least one emitter formed on the substrate including,

an insulator layer having at least one opening to define the location and shape of the at least one flat emitter device,

an emission layer disposed within the at least one opening of the insulator layer and further disposed over the insulator layer;

a tunneling layer disposed over the emission layer;

a cathode layer disposed over the tunneling dielectric; and

a protective layer disposed over cathode layer, the protective layer having at least one opening in substantial alignment with the at least one opening of the insulator layer.

44. The integrated circuit of claim 43 wherein the protective layer is comprised of titanium or molybdenum of about 300 to about 1500 Angstroms in thickness.

45. The integrated circuit of claim 44 wherein the emission layer is formed of polysilicon.

46. The integrated circuit of claim 45 wherein the tunneling layer is comprised of thermal oxide grown from polysilicon layer.

47. The integrated circuit of claim 44 further comprising an electron lens disposed on the at least one emitter.

48. A method for creating an emitter having a cathode emission surface, comprising the steps of:

forming a protective layer that is conductive on the cathode emission surface;
creating an electronic lens structure over the protective layer; and
etching the protective layer to expose the cathode emission surface.

49. An emitter created by the process of claim 48.

50. The method of claim 48 wherein the step of applying the protective layer further comprises the step of applying a layer of titanium or molybdenum to a thickness of about 300 to about 1500 Angstroms.

51. The method of claim 48 further comprising the step of applying a cathode layer on a tunneling layer disposed over an electron supply, the cathode layer including gold or platinum.

52. The method of claim 48 wherein the electronic lens structure includes a spacer layer, further comprising the step of etching the spacer layer before etching the protective layer and wherein the spacer layer etch rate and the protective layer etch rate have an etch selectivity greater than or equal to about 10:1.

53. The method of claim 48 wherein the protective layer is etched with sulfuric peroxide or ammonia and water to create the exposed cathode emission surface.

54. The method of claim 53 wherein the sulfuric peroxide etch is performed using about 1 part H_2O and about 2 parts H_2SO_4.

55. A method for creating an emitter on an electron supply, comprising the steps of:

applying a tunneling layer on the electron supply;

applying a cathode layer on the tunneling layer;

applying a protective layer that is conductive on the cathode layer;

applying an electron lens structure on the protective layer; and

creating an opening in the electron lens structure and protective layer to the cathode surface.

56. An emitter created by the process of claim 55.

57. The method of claim 55 wherein the applied protective layer is titanium or molybdenum having a thickness of about 300 to about 1500 Angstroms.

58. The method of claim 55 further comprising the step of creating the electron lens on the protective layer with a layer of tetraethylorthosilicate (TEOS), silicon oxides, silicon nitrides, or combinations thereof.

59. The method of claim 58 wherein the step of creating an opening further comprises the step of etching the TEOS layer before etching the protective layer and wherein the TEOS layer etch rate and the protective layer etch rate have an etch selectivity of at least about 10:1.

60. The method of claim 59 further comprising the step of etching the protective layer after etching the TEOS layer with sulfuric peroxide to create the opening to the cathode surface.

61. The method of claim 60 wherein the sulfuric peroxide etch is performed using about 1 part H_2O and about 2 parts H_2SO_4.

62. A method for creating an emitter, comprising the steps of:

creating a tunneling layer over an electron supply surface;

applying a cathode layer over the tunneling layer;

applying a first protective layer on the cathode layer;

applying a first conductive layer on the first protective layer;

applying a second protective layer on the first conductive layer;

applying a spacer layer on the second protective layer;

applying a second conductive layer on the spacer layer;

creating an opening between the second conductive layer and the second protective layer;

etching the second protective layer to the first conductive layer;

etching the first conductive layer to the protective layer; and

etching the first protective layer to the cathode layer.

63. An emitter created by the process of claim 62.

64. The method of claim 62 wherein at least one of the applied first and second protective layers is titanium or molybdenum.

65. The method of claim 62 wherein the spacer layer is tetraethylorthosilicate, silicon oxides, silicon nitrides, or combinations thereof.

66. The method of claim 62, further comprising the step of depositing polysilicon to create the electron supply surface.

67. The method of claim 62 wherein the step of creating an opening further comprises the step of etching the spacer layer before etching the second protective layer and wherein the spacer layer etch rate and the second protective layer etch rate have an etch selectivity of at least about 10:1.

68. The method of claim 62 wherein the first protective layer is etched with sulfuric peroxide to create the exposed cathode emission surface.

69. The method of claim 68 wherein the sulfuric peroxide etch is performed using about 1 part H_2O and about 2 parts H_2SO_4.